

IS 5245 (Part 2) : 2013

(Reaffirmed 2019)

भारतीय मानक

तार रस्सी स्प्लाइसिंग की पद्धतियाँ

भाग 2 फेरूल सहित स्लिंग लेग — सुरक्षित आई टर्मिनल

( पहला पुनरीक्षण )

*Indian Standard*

METHODS FOR SPLICING OF WIRE ROPES

PART 2 WIRE ROPE SLING LEGS WITH FERRULE — SECURED EYE TERMINAL

( *First Revision* )

ICS 77.140.65

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**BUREAU OF INDIAN STANDARDS**  
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NEW DELHI 110002

October 2013

Price Group 3

## FOREWORD

This Indian Standard (Part 2) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Wire Ropes and Wire Products Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1971. This revision has been taken to align it with latest industrial practices prevailing in country.

This part covers wire rope sling legs with ferrule — secured eye terminal. The eye terminal covered in this standard is formed by looping the rope back parallel to the main part (positioned side by side) and joining the parts by means of a ferrule under pressure, hence known as mechanical splicing. The other part in the series is:

### Part 1 Hand splicing of wire ropes

The security of an eye terminal is controlled by initial prototype acceptance testing followed by routine testing. It is the requirement of this standard that the ferrule be of a type which has passed the prototype tests.

As it becomes practically difficult to identify the make and quality of wire rope once it is spliced, it is recommended that the manufacturer of the slings shall provide to the buyer, a test certificate of BIS Certification Mark wire rope used in the process.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard***METHODS FOR SPLICING OF WIRE ROPES****PART 2 WIRE ROPE SLING LEGS WITH FERRULE — SECURED EYE TERMINAL***( First Revision )***1 SCOPE**

**1.1** This standard (Part 2) covers the requirements of wire rope slings made from wire ropes. The sling legs are terminated by ferrule secured eyes, with or without thimbles or other fittings as specified by the purchaser.

**1.2** Prototype tests covering the initial acceptance of the process and routine tests are specified.

**2 REFERENCES**

The following standards contain provisions, which through, reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
1500 : 2005	Method for brinell hardness test for metallic materials
1828 (Part 1) : 2005	Metallic materials — Verification of static uniaxial testing machines: Part 1 Tension/compression testing machines — Verification and calibration of the force-measuring systems
2266 : 2002	Steel wire ropes for general engineering purposes — Specification ( <i>fourth revision</i> )
2315 : 1978	Thimbles for wire ropes
2363 : 1981	Glossary of terms relating to wire ropes — Specification ( <i>first revision</i> )
2762 : 2009	Specification for wire rope slings and sling legs ( <i>first revision</i> )
3459 : 2004	Small wire ropes — Specification ( <i>second revision</i> )
4190 : 1984	Eye bolts with collars
5245 (Part 1) : 1969	Methods for splicing of wire ropes: Part 1 Hand splicing of wire ropes
10942 : 2000	Ferrule — Specification ( <i>first revision</i> )

**3 TERMINOLOGY**

For the purpose of this standard, the definitions given in IS 2363 and the following shall apply.

**3.1 Ferrule Secured Eye Terminal** — A wire rope eye terminal is made by looping the rope back, parallel to the main part, side by side and securing the two parts at the throat of the eye by means of a metallic ferrule, subjected to radial pressure in one stroke to form the joint.

**3.2 Swaged Fittings** — Fittings in which wire rope is inserted and attached by cold flowing method.

**4 MATERIAL****4.1 Wire Rope**

The wire rope used for making the slings shall comply with IS 2266 or IS 3459. The rope can be of any variety as desired by the purchaser as long as it complies with the above standards.

**4.2 Ferrule****4.2.1 Type and Material of Ferrule**

The ferrules used for making the slings shall comply to IS 10942. Further they should pass the prototype tests as specified in **9** and routine tests as specified in **10**. The hardness of the ferrule material shall not be less than 40 HB (*see* IS 1500).

**4.2.2 Size of Ferrule**

The size of the ferrule used shall comply with the dimensions given in IS 10942. After splicing, the ferrule shall become round in section. The diameter of ferrule shall be minimum twice the diameter of wire rope. The length of ferrule shall strictly comply with IS 10942 before and after splicing.

**4.2.3 Workmanship**

The ferrule shall be free from defects. It shall be examined by a competent person before and after assembly. The wire rope end shall protrude by minimum half the diameter of the wire rope to ensure proper swaging.

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### 4.2.4 Fittings

End fittings when used like thimbles and eye bolts shall conform to IS 2315 and IS 4190 respectively.

## 5 FABRICATION

**5.1** The slings shall be fabricated from new wire rope. It is essential to have a certificate certifying the breaking load of the wire rope to be used for making slings by the manufacturer.

**5.2** The slings can be of a single leg or multiple legs, assembled with rings as per IS 2762.

### 5.3 Loop Size

For slings without end fittings, if not otherwise specified by the purchaser, the loop size shall be 16 times the nominal diameter of wire rope. The loop size shall be measured from the outside end of the ferrule to the outside face of the loop, in linear direction, in free condition.

### 5.4 Number of Ferrules

There shall be one ferrule at each end of the sling to complete the loop. Use of more than one ferrule at one end is discouraged.

### 5.5 Excess Material

After splicing, excess material flowing out of the die on along the length of ferrule if any, deforming its round shape, should be removed to give a smooth round shape to the ferrule.

## 6 PERMISSIBLE WORKING LOAD

For normal conditions of service the permissible working load shall not exceed one-sixth of the actual breaking load of the wire rope used. The actual breaking load of the wire rope shall be equal to or more than the minimum breaking load specified in the IS 2266 or IS 3459 for the corresponding wire rope used. For multiple legged sling, the included angle between the legs must be considered before arriving at the safe working load as per IS 2762.

## 7 PROOF LOADING

**7.1** The completed sling shall be proof loaded to twice the safe (permissible) working load. The proof load shall be accurate to within  $\pm 5\%$  percent of applied load.

In case of multi legged assembly, each leg is to be individually subjected to proof loading. The fittings like main and sub rings, hooks, etc, are to be individually tested for the proof load of the complete assembly.

### 7.2 Inspection

Each sling shall be inspected by a competent person

after assembly and also the competent person shall witness the proof load testing. The completed sling shall be free from any visual flaws or defects.

## 8 DESIGNATION

Wire rope slings with ferrule secured eye terminals shall be designated by the number of legs, size, construction, coat and core of the wire rope, effective length of the sling, safe working load and the number of this standard.

*Example* — A two legged sling assembly with ferrule-secured eye terminals for a wire rope of diameter 16 mm and 6 × 36 construction, ungalvanised, steel core with a safe working load of 53.6 kN at 0° shall be designated as:

Sling 2 L, 16, 6 × 36, UNG, WSC, 53.6 kN/0°, IS 5245 (Part 2)

## 9 TESTS

### 9.1 Prototype Tests

Eye terminals made with each type of ferrule shall be subjected to the prototype tests specified in **9.1.1** and **9.1.2**.

Subsequent to these tests, all ferrules shall be examined for cracks and for indications of the wire 'pulling out'. If cracks or other defects are found, sling legs made with the particular type of ferrule under consideration shall be deemed not to comply with this standard. This type of ferrule may, however, be re-submitted for prototype testing accompanied by a detailed report from the makers, explaining why the defects occurred and what measures have been taken to avoid such failures in future.

#### 9.1.1 Breaking Load Test to Destruction

One sling leg with ferrule-secured eye terminals made with each size shall be subjected to a prototype breaking load test as under.

**9.1.1.1** A ferrule-secured eye termination shall be formed without a thimble at each end of the test piece. The length of clear rope between the ferrules shall be at least 1 m and the load shall be so applied to the ferrule-secured eye terminals that the eye shape is not significantly collapsed or distorted.

Not more than 4/5 of the minimum breaking load of the rope as specified in IS 2266 or IS 3459 shall be applied quickly. Thereafter the load shall be applied slowly and steadily until the actual breaking load is reached. After the destructive failure, the ferrule shall remain intact.

The sling shall have passed the test, if the breaking load is in excess of the minimum breaking load of the rope.

The accuracy of the testing machine shall be in accordance with IS 1828 (Part 1).

### 9.1.2 Durability Test by Pulsatory Loading (Endurance Test)

**9.1.2.1** One slings leg in each of the two representative sizes of a rope of particular construction shall be subjected to the endurance test. The two rope sizes shall be respectively the largest and the smallest covered by the particular process.

**9.1.2.2** The two samples shall than be subjected to one of the following endurance tests by pulsatory loading. The test sample shall have a ferrule-secured eye terminal at each end and shall be fitted with solid thimbles. The length of clear rope between the ferrules shall be at least 1 m. Each test shall be performed in one continuous run without interruption. For compliance with this standard the sling leg shall withstand not less than 75 000 cycles of either test, at the conclusion of which there shall be no broken wires.

#### 9.1.2.2.1 First alternative test

Each sling shall be subjected to a cyclical tension varying from no load to twice of the permissible working load, at a frequency of 20 cycles/min with a tolerance of  $\pm 10$  percent. The loading phase of each cycle shall be smooth. The sling leg shall not sag or flex at no load in such a manner as would result in a jerk when the load is applied again (see Fig. 1).

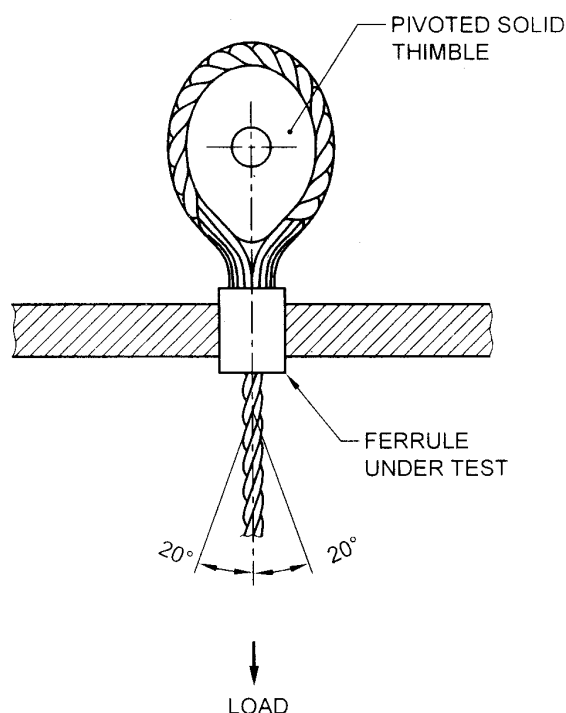


FIG. 1 DURABILITY BENDING TEST

#### 9.1.2.2.2 Second alternative test (For use when a fatigue tensile testing machine is available)

Each sling leg shall be subjected to a cyclical tension varying between the permissible working load values (see 6) to twice of these values, with the machine set at a frequency not exceeding 250 cycles/min. The machine shall be of a type that applies a cyclical tension along the rope axis, producing the same stress pattern at both the fixed and moving anchorages with a maximum frequency variation of  $\pm 3.5$  percent.

**9.1.3** For compliance, the ferrule-secured eye terminals shall outlast the hand-spliced eye terminal. The method for hand-splicing of wire ropes is laid down in IS 5245 (Part 1).

## 9.2 Routine Testing

### 9.2.1 Tensile Testing

Unless otherwise agreed to between the purchaser and the manufacturer, samples of completed slings shall be subjected to destructive tensile loading and the sling shall not break before the minimum breaking load of the rope as specified in IS 2266 or IS 3459.

### 9.2.2 Checking of Dimensions of Completed Ferrule

The diameter of the ferrules shall not differ by more than  $\pm 2$  percent as specified in IS 10942. The length of the ferrule shall not be less than that specified in IS 10942.

## 10 CERTIFICATE OF TEST

With each sling fitted with ferrule secured eye terminal (Mechanically Spliced Sling), the manufacturer shall supply a test certificate. The form of the certificate should be as indicated in Annex A.

## 11 MARKING

**11.1** Each sling shall be marked by punching the following details on the ferrule (on one or two) with letter sizes 3 mm up to 10 mm wire rope, 5 mm from 11 mm up to 20 mm, 7 mm from 21 mm up to 32 mm and 10 mm from 33 mm and above wire rope:

- Manufacturers identification mark;
- Size of wire rope, in mm;
- Effective length of sling, in m;
- Permissible working load, in kN (Ton); and
- Batch No./Identification number.

The punching should not be too deep to weaken the ferrule.

### 11.2 BIS Certification Marking

Details available with the Bureau of Indian Standards.

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**11.2.1** The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of Standard Mark may be granted to manufacturers or

producers, may be obtained from the Bureau of Indian Standards.

### **12 PACKING**

The slings shall be suitable packed to avoid damage in transit.

## **ANNEX A**

(Clause 10)

### **PROFORMA FOR PROOF LOAD CERTIFICATE OF MECHANICALLY SPLICED SLING (WITH FERRULE-SECURED EYE TERMINAL)**

1. Test certificate number:
2. Name and address of the manufacturer of slings:
3. Batch number (Identification number):
4. Description of sling (Details of number of legs and end fittings):
5. Diameter, construction, coat and core of wire rope:
6. Date of test of slings:
7. Breaking load of the sling sample/Wire rope used:
8. Safe working load of sling:
9. Proof load applied during testing:
10. Name and address of public service, association, company or firm making the test and examination:
11. Name and address of signatory in public service, association, company or firm making the test and examination:

I certify that each sling has met the proof loading requirements specified in **7.1** of IS 5245 (Part 2) and has been inspected in accordance with **7.2** of IS 5245 (Part 2).

The above particulars are correct and the test and examination were carried by me.

Signature of the competent person

Date:

Name and Designation

**ANNEX B***(Foreword)***COMMITTEE COMPOSITION****Wire Ropes and Wire Products Sectional Committee, MED 10**

<i>Organization</i>	<i>Representative(s)</i>
Directorate General of Mines Safety, Dhanbad	SHRI G. N. VENKATESH ( <b>Chairman</b> )
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BIS Directorate General	SHRI C. K. VEDA, Scientist 'F' and Head (MED) [Representing Director General ( <i>Ex-officio</i> )]
<i>Member Secretary</i> SHRI D. K. DAS Scientist 'E' (MED), BIS	



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This Indian Standard has been developed from Doc No.: MED 10 (1008).

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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